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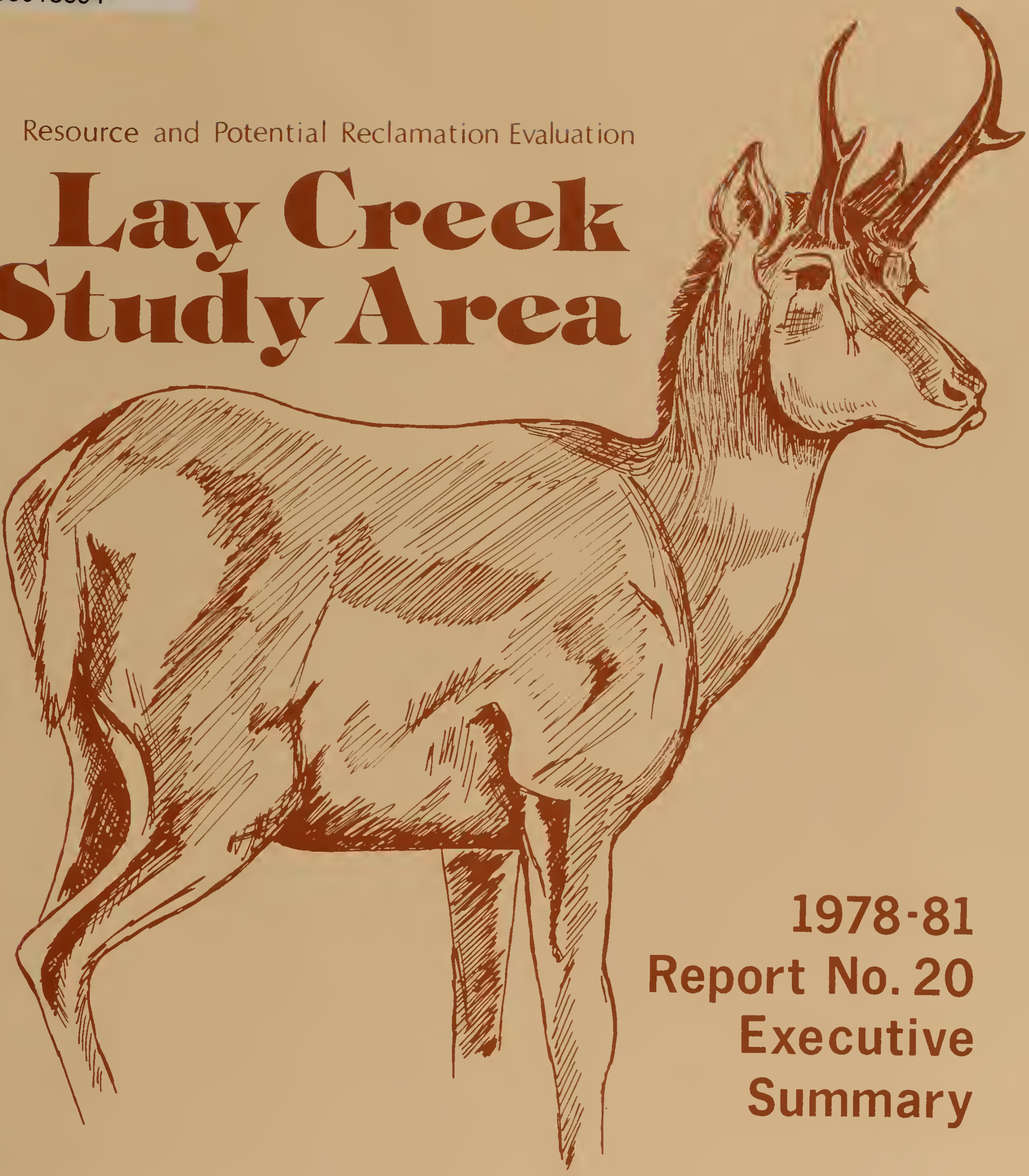
Resource and Potential Reclamation Evaluation

Lay Creek Study Area



1978-81
Report No. 20
Executive Summary

United States Department of the Interior
Bureau of Land Management
Bureau of Reclamation
Geologic Survey

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LAY CREEK STUDY SITE REPORT

Published September 1981

The Federal Coal Management Program has been designed as an interagency cooperative effort to meet National energy objectives.

Lay Creek Study Site Report was prepared through the efforts of the U.S. Department of the Interior, principally, the Bureau of Land Management, Geological Survey, and Bureau of Reclamation. The study effort began in 1978 and was concluded in 1981 with the publication of this report.

The area described in this report has been tentatively determined to be a potential Federal coal development area. The purpose of this report is to provide information on the area's reclamation potential should coal development occur. This report will assist managers in making final Federal coal leasing decisions.

Editor's Note: In order to more closely associate the EMRIA program with the Federal Coal Management Program, the name "EMRIA" was officially dropped from use in May 1981. The responsibilities of the EMRIA program now come under "Technical Investigations in Support of the Federal Coal Management Program."

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Lay Creek Study Area

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The executive summary report briefly describes the resource and potential reclamation evaluation of the Lay Creek study area of northwestern Colorado.

The report shows the land surface and mineral ownership status of the Lay Creek study area. A brief description of the site is presented which includes geology, coal resources, overburden materials, soils, vegetation, wildlife, and visual resources.

The reclamation potential and alternatives section of the summary includes information on the post-mined land use objectives, a summary of reclamation problems and recommended measures for reclamation, the geographical area the study can be applied to, and recommendations for land management during the reclamation period.

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EXECUTIVE SUMMARY

Introduction

Recent energy shortages have focused the attention of the Nation on the large coal reserves of the Western States. The Federal Coal Management Program is a recognition of our needs to develop these energy resources without degrading the quality of the air, water, soil, vegetation, and wildlife of the affected areas.

It is the responsibility of the Department of the Interior and, principally, the Bureau of Land Management to assist in meeting the increasing demands for energy and, at the same time, provide sound guidelines for reclamation of the disturbed areas.

Purpose of Study

The purpose of this study was to gather baseline data to determine the feasibility of poststrip-mining reclamation of the Lay Creek study site. This study included research on the geology, hydrology, physiography, topography, soils, overburden, climate, vegetation, wildlife, and visual resources of the area. This summary presents a brief, nontechnical discussion of the detailed studies. Backup data may be found in the Main Report and Appendixes.

Location and Description

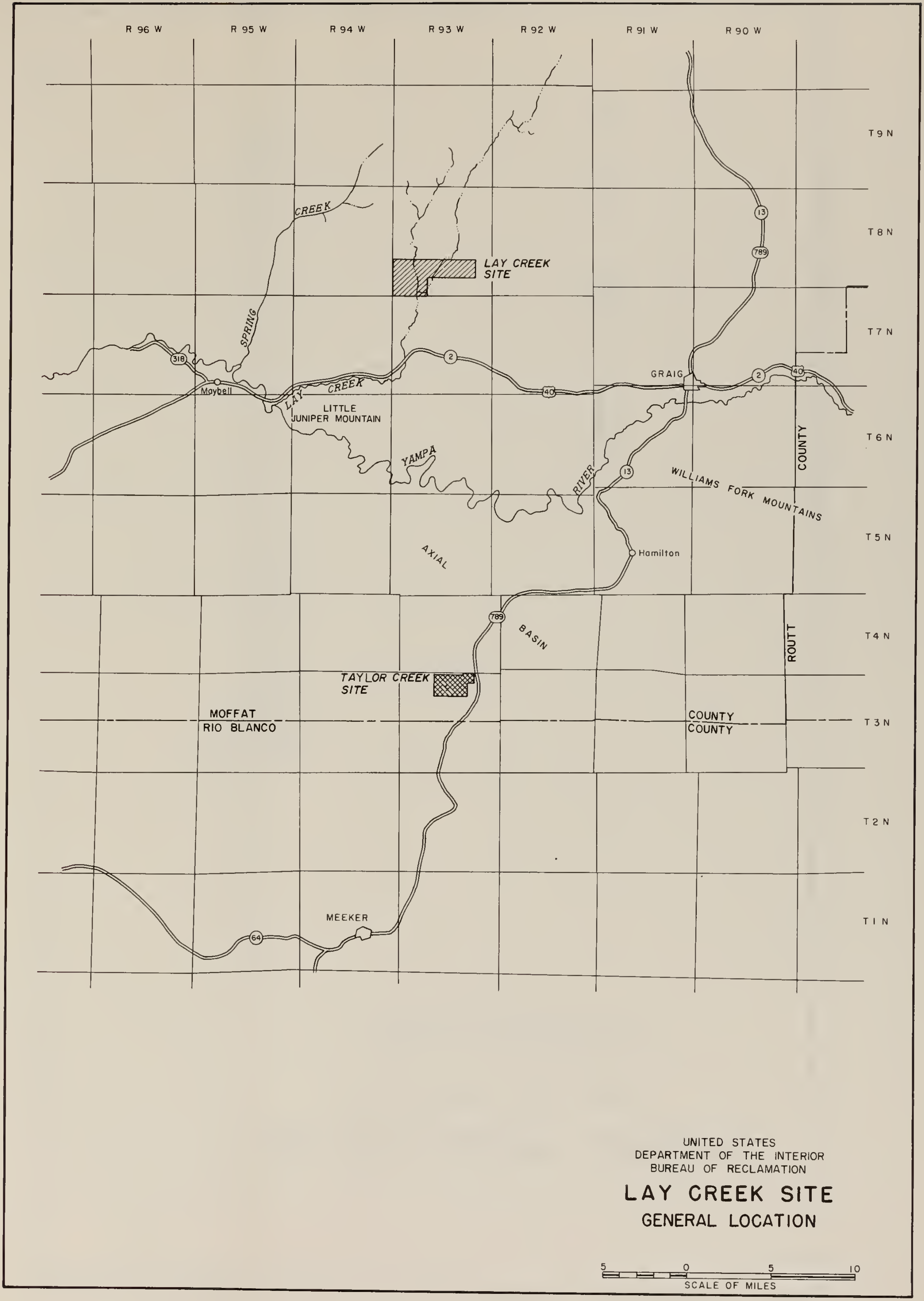
The study site is located about 20 miles northwest of Craig, Colo. It includes 3,645 acres in secs. 26, 27, 28, 29, 30, 31, and 32, T. 8 N., R. 93 W., in Moffat County, Colo. A general location map is presented on the following page.

The study site is situated in the Wyoming Basin Physiographic Province of the Rocky Mountain Region of the Intermountain Plateau. It is in the southern part of an extensive area of rolling prairie broken by more or less prominent hogbacks and cuesta ridges.

The study site is drained by Lay Creek, a tributary to the Yampa River.

Elevations range from 6,400 to 7,000 feet above sea level. The site includes alluvial valley bottom lands and sloping mesas which often terminate in precipitous escarpments of sandstone.

An ownership map is presented on page 3 and depicts the surface ownership of the study area.



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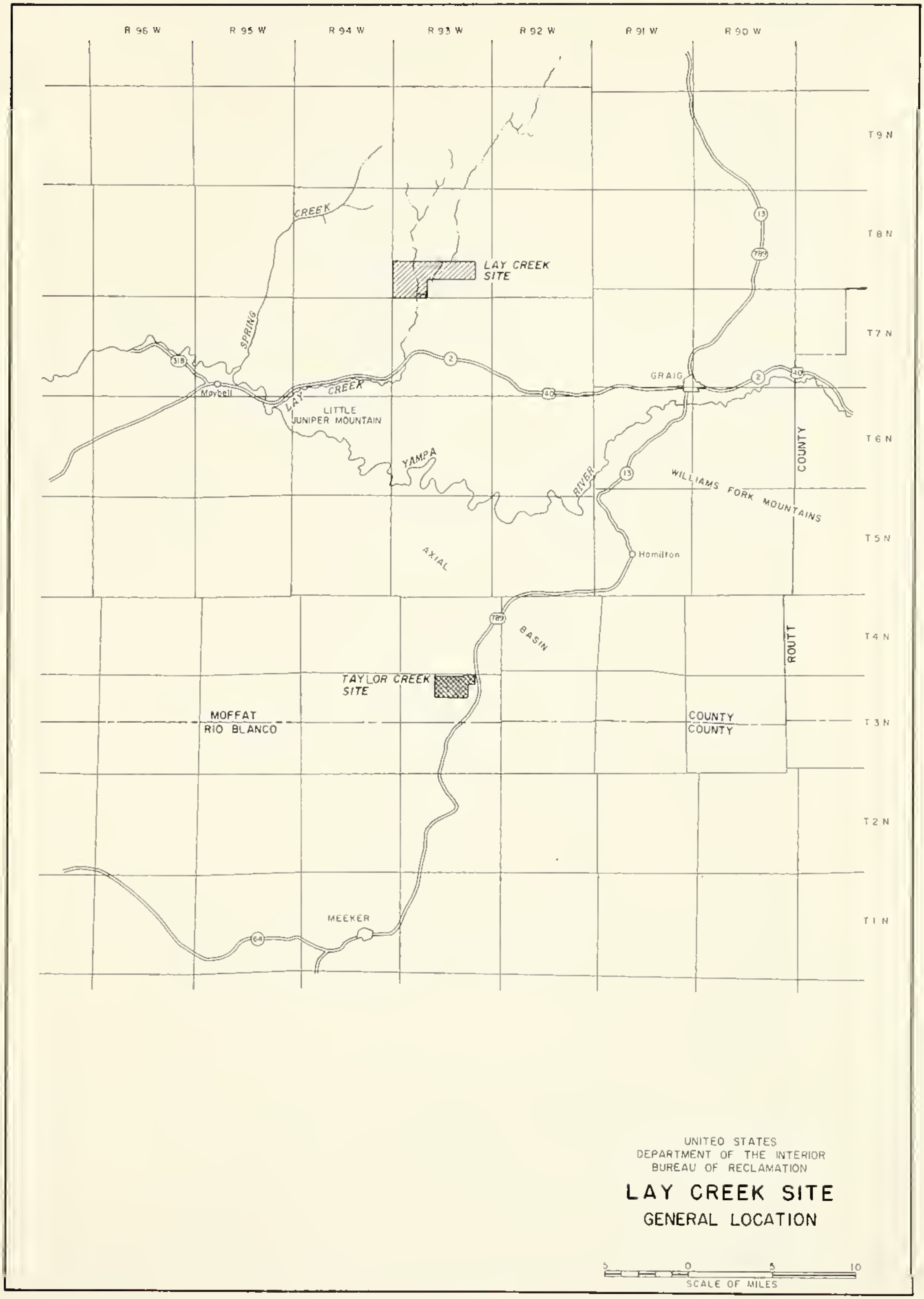

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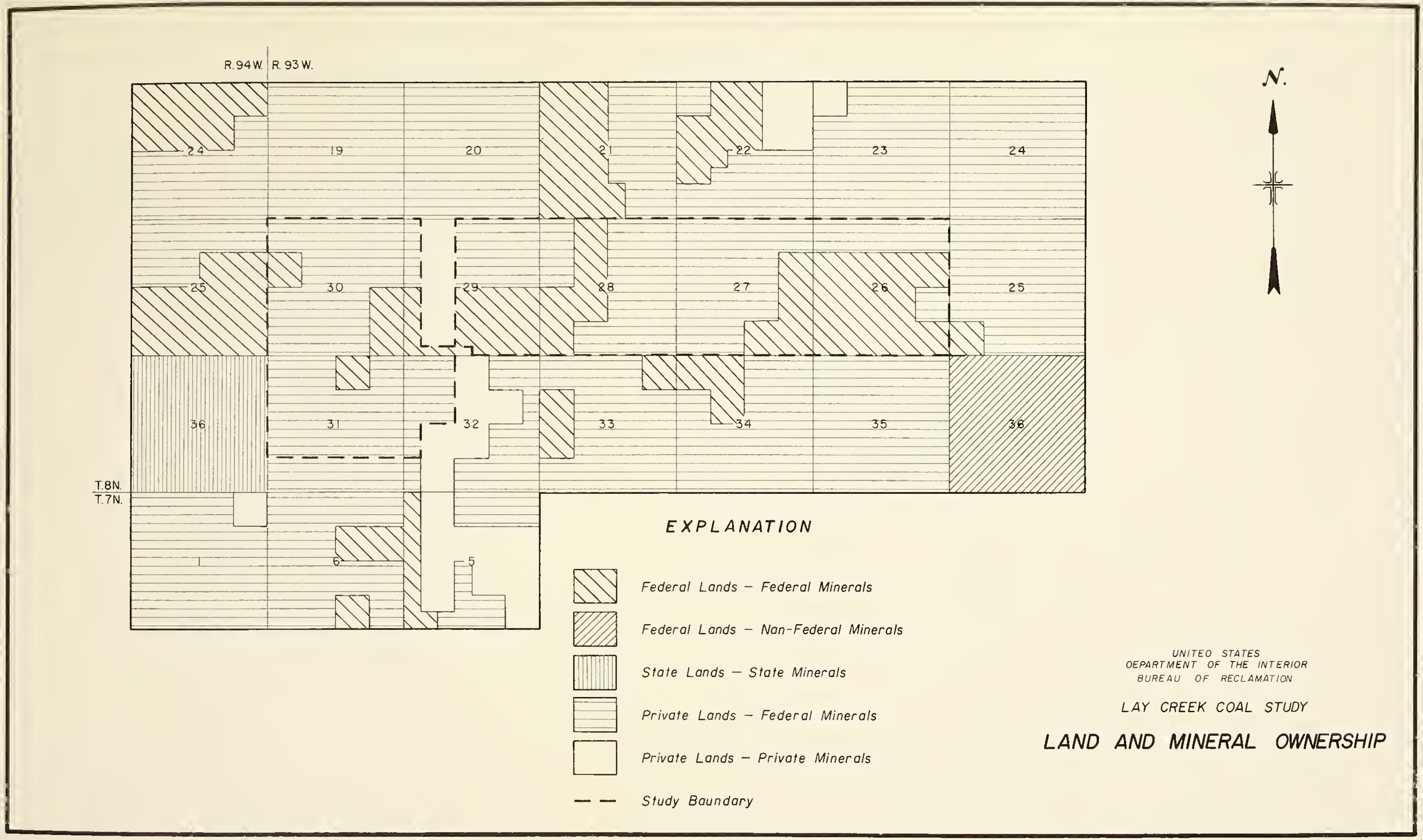
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EXPLANATION
Federal Lands – Federal Minerals
Federal Lands – Non-Federal Minerals
State Lands – State Minerals
Private Lands – Federal Minerals
Private Lands – Private Minerals
Study Boundary

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LAY CREEK COAL STUDY

LAND AND MINERAL OWNERSHIP

View looking west across Lay Creek showing the alluvial bottoms and sloping mesa lands.

Climate

The Lay Creek study site is located in the western Colorado semiarid region. It has a highland continental climate characterized by cold winters and warm summers.

The seasonal mean temperatures for Craig, Colo., 14 miles southeast of the study site, are 57° F for the summer (April through September) and 28° F for the winter (October through March).

The frost-free period is approximately 90 days from early June to late August. The growing season for hardy crops and native grasses is about 148 days from early May to late October.

The basic mechanisms for producing precipitation in the study site area are (1) large-scale organized storm systems which occur in the winter and spring seasons, (2) orographic lifting which occurs during the same seasons when the prevailing westerly flow aloft is the strongest, and (3) convection thunderstorm activity which is the dominant mechanism during midsummer when large-scale atmospheric circulation is weak but solar insulation and heating are strong.

The precipitation is very irregular, much of it coming in the form of winter snow and heavy showers, with long intervals of drought and hot, dry winds in the summer.

Average seasonal precipitation for summer (April through September) is 7.2 inches and for winter (October through March) is 6.1 inches. Considerable variation occurs in annual and seasonal precipitation. The annual precipitation has varied from 18.7 inches to 7.4 inches. This extreme difference could cause problems in revegetation efforts.

Annual snowfall averages 69.1 inches with 40 percent falling in January and February.

Resource Analysis Summaries

Geology and coal resources

The study area is located on the north flank of the Mud Spring Anticline. The anticlinal axis trends approximately N. 50° W. Exposed rocks are sedimentary in origin and are of Tertiary Age formations.

Four deep drill holes (3-inch-diameter) were drilled in the study site to determine the type of bedrock and the location of the coal seams. The Fort Union Formation overlies the Lance Formation as shown by these drill holes. The Fort Union Formation consists of interbedded sandstones, siltstones, shale, and coal. Two of the coal seams found in the upper portion of the formation, the Emerson and Blevins seams, are locally quite thick and are of economic importance. From the drill hole data, the Blevins seam ranged from 10 to 14.5 feet thick. The Emerson seam, deeper than the Blevins, ranged from 10 to 25 feet thick. The Fort Union Formation is about 1,400 feet thick and is unconformably overlaid by the Wasatch Formation. The Wasatch Formation outcrops in the northwest corner of the study sites and consists of brown, coarse-grained sandstone interbedded with grey and red shale.

The coals found in the Fort Union Formation are subbituminous in rank. The table on the following page is a summary of the demonstrated coal resources for the Emerson and Blevins coal beds within the Lay Creek study area.

Coal resources
Lay Creek study area

Bed name	Demonstrated resources[1] (tons)
Area I	
Blevins	19,610,000
Emerson	46,920,000
Area II	
Blevins	24,280,000
Emerson	50,860,000

[1] These resource estimates are preliminary and subject to revision.

Samples from the four drill holes were used in greenhouse and weathering tests to determine their suitability as plant growth media. They were also chemically analyzed for toxic materials.

Results of these tests indicated most of the overburden is unsuitable or has limited suitability as planting media. Most of the samples from Drill Holes 3 and 4 were too high in sodium to support good plant growth. Because of the limited or unsuitable characteristics of most of the overburden materials, it will be necessary during reclamation and revegetation to require a topsoil dressing be placed over the raw overburden spoil banks.

Overburden, soils, and land classification

A detailed land classification survey was made of the study site. Its purpose was to determine the quantity and quality of suitable soil and overburden that could be used as a plant growing media to cover the strip-mined areas.

The land classification specifications used closely follow the Bureau of Reclamation's arable land classes used for irrigation development. They take into consideration the following factors: texture, depth, permeability, salinity, sodicity, available water-holding capacity, and erodibility.

The land was classified into four classes, three suitable (1, 2, and 3) and one unsuitable (class 6).

Class 1 lands are the best source of plant growth media. They have no restrictions and occupy 31 percent of the area.

Class 2 lands have slight limitations and are less suitable for planting media. They are usually shallower or have some other slight deficiency which make them less suitable. They occupy 14 percent of the study site.

Class 3 lands have more serious deficiencies such as shallow depths, steep topography, salt content, or gravel. They have limited suitability for planting media and occupy 9 percent of the site.

Class 6 lands are unsuitable as plant growth media because of their physical or chemical properties. They occupy 46 percent of the Lay Creek site.

There should be adequate suitable planting media to cover the reshaped soil to a sufficient depth to support revegetation of the site.

Vegetation

The vegetation was mapped into 12 ecological subdivisions or range sites. Differences in environmental factors, predominantly climate, soils, and topography, result in different plant communities. The 12 range sites described are rolling loam, clayey slopes, clayey foothills, foothill swale, sandy foothills, swale meadow, stony foothills, deep loam, alkaline slopes, claypan, loamy breaks, and one unnamed site. These were described in their present condition and their potential or climax condition. Some of the sites were in poor condition with others in fair to good condition.

Wildlife habitat

The study area provides habitat for a variety of wildlife species inhabiting the sagebrush-grassland ecosystem. There may be 20 to 40 antelope found year round on the study site. Mule deer utilize the area as a migration route and winter area.

Many raptors are common users of the area. The bald eagle is an occasional winter user of the site. There are several active golden eagle nests in the vicinity of the study site.

Sage grouse are known to inhabit the study area. There is a sage grouse strutting ground in the northwest section of the Lay Creek study area.

Aquatic and riparian habitats are found along Lay Creek. These areas provide nesting, roosting, and feeding habitat for waterfowl, songbirds, and raptors.

Visual resources

The visual resources of the Lay Creek area are typical and not uniquely different from the adjacent drainage areas west of Craig. Topography of Lay Creek, besides the drainage basin, is best described as rolling hills with a few abrupt sandstone outcroppings. Two visual resource management classes exist within the study site--a class III for the Lay Creek drainage and a class IV for the remaining portion of the area. During strip mining, severe visual impacts would be manifested on any areas adjacent to the visual corridors of County Road 17.

EXECUTIVE SUMMARY

Reclamation Potential and Alternatives

Postmining land use objectives

It has been determined, according to postmining use objectives, that the Lay Creek study area should be returned to its present land use management level, with capabilities equal to or better than its present condition. Land uses are presently dryfarming and native rangeland. The area is used by wildlife, hunters, and other occasional recreationists.

Summary of reclamation problems and recommended measures

The feasibility of revegetation and reclamation of the Lay Creek site will depend upon a number of factors including climate, soil and overburden, hydrology, and topography. The information gathered during this study indicates an opportunity exists to successfully revegetate and reclaim the surface-mined area of Lay Creek if proper techniques and management practices are used.

One of the most significant problems is the high sodium content of much of the overburden and deep subsoils. This requires that a suitable plant growth media be placed over this unsuitable material.

Because of the nutrient deficiencies of the soils, a well balanced fertilizer will have to be applied to provide the required nutrients for revegetation.

It is difficult to revegetate an area that has a semiarid climate like Lay Creek has. The low rainfall (about 12 inches per year) and the high evapotranspiration rate in the summer make it imperative that the limited precipitation that falls is made available for revegetation. The spoil piles should be graded to reduce runoff. Other practices such as contour plowing or catch basins should be used to intercept and contain the moisture and allow it to be absorbed by the soil. These cultural practices would also reduce the wind and water erosion.

The results of this study can probably be applied to most lands of similar soil and overburden characteristics throughout the area.

Recommendations for land management during reclamation period

Seasonal wind erosion will probably be the greatest problem during reclamation. The strip mining will remove the vegetation which helps hold the soil from being eroded by the wind.

Roughening the surface and planting a fast growing annual cover crop would mitigate the damage from wind and water erosion during reclamation.

EXECUTIVE SUMMARY

The area will have to be protected from grazing until the revegetation is well established. Once established a planned grazing program should be used.

To maintain adequate fertility levels in the soil, a fertilization program will have to be followed for several years.

In the event weed growth threatens the survival of the seeded species during establishment, acceptable methods of weed control should be used.

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